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ORIGINAL ARTICLE

Outcome in Surgically Treated Patients with Dorsal and Dorsolumbar Spinal Tuberculosis: A Retrospective Study of 40 Cases

ZAFAR IQBAL, MUHAMMAD ANWAR, SALMAN RAZA JAFARY
Tariq Salahuddin
Department of Neurosurgery, Lahore General Hospital, Lahore

ABSTRACT:

Study Design: *A retrospective study examining the clinical features, management and treatment outcome in patients with dorsal and dorsolumbar spinal tuberculosis with severe neurological deficit treated surgically.*

Objective: *To determine the influence of disease severity and surgical treatment in patients with dorsal and dorsolumbar spinal tuberculosis with severe neurological deficit.*

Methods: *In this retrospective study (2005 – 2009) medical records of all patients with dorsal and dorsolumbar spinal tuberculosis treated surgically by Zafar Iqbal were analyzed. The clinical features, disease severity, operative procedures and outcome and factors affecting outcome were analyzed.*

Results: *A total of 42 patients with dorsal and dorsolumbar spinal tuberculosis with severe neurological deficit were treated surgically during this period. Two patients had follow-up of less than 3 months and were excluded from this study. Their age ranged from 18 to 65 years, with a mean age of 31 years. Male to female ratio was 3:2. Presenting symptoms were local pain in 34 (85%), radicular pain in 5 (12.5%), dysaesthesias in 5 (12.5%), motor deficits, GO (MRC Grading) in 28 (70%), G3/5 in 12 (30%) patients. Spasticity was present in 36 (90%) patients, sensory deficit in 38 (95%) and sphincter involvement in 24 (60%) patients. MRI revealed anterior compression with vertebral body involvement in 36 (90%), posterior vertebral element involvement in 2 (5%) and no bony involvement in 2 (5%) patients. Severe kyphotic deformity (kyphotic angle > 25 degree) was present in 34 (85%) patients. Thirty two (80%) patients had corpectomies and titanium cage fixation, 2 (5%) patients had costotransversectomy, 2 (5%) had laminectomy and posterior fixation with Hartshell loop and 4 (10%) patients had decompressive laminectomy and removal of extradural granulation tissue. Local and radicular pain was relieved in all patients, 2 patients had persistent dysaesthesias. Motor function improved to G5-5/5 in 35 (87.5%) patients, Spasticity improved in 32 (88.88%), sensory deficit improved in all patients. Bladder function improved in 21 (87.5%), Kyphotic deformity was corrected by 18 degrees on average.*

Conclusion: *This study indicates that a significant proportion of patients with spinal tuberculosis and severe motor deficits get remarkable improvement after surgical decompression and hence should undergo surgery even though they may be suffering from paraplegia of considerable duration. We found that age less than 50 years, radical surgery and spasticity are favourable prognostic factors.*

INTRODUCTION

Tuberculosis of spine is present in most parts of the world and there is a trend toward an increase in both developing and developed countries, this is in parallel with the growing number of immunocompromised patients.[1] Spinal tuberculosis accounts for about 2 to 3 percent cases of tuberculosis[2] representing the most common type of osteoarticular tuberculosis.[3] Spinal tuberculosis results in significant morbidity and mortality[4] and delay in diagnosis is associated with

increase frequency and severity of complications.[4]

(International guidelines advocate the treatment of uncomplicated (HIV negative, fully sensitive *Mycobacterium Tuberculosis*) spinal tuberculosis for a period of 6 months with multiple drugs regimen based on rifampicin and isoniazid.[5,6] This is based on the multicentre randomized controlled trials of the Medical Research Council (UK).[7,8] However, compliance with these guidelines in terms of the duration of treatment seems to be poor internationally).[9]

Although, chemotherapy remains the mainstay in the treatment of spinal tuberculosis, surgical procedures also play an important role. Various surgical procedures have been used to treat TB. Combined radical debridement and anterior fusion has been advocated by most authors.[5,6]

As early diagnosis is possible due to availability of MRI, many patients can be treated conservatively with antituberculous drugs alone but this conservative approach cannot prevent possible progression of kyphotic deformity and long term rest is typically required to achieve the relief of severe back pain. The placement of rigid stabilization system may prevent kyphosis and lend immediate relief of pain caused by spinal instability.[7] Loss of most deformity correction occurs in 3 to 18 months postoperatively.[8]

In recent years, numerous studies have advocated radical anterior surgery (debridement and grafting) for correction and prevention of khphosis in case of spinal tuberculosis.[9] The reason is that debridement alone can result in development of kyphotic deformity.[9] Even this radical surgery is not always sufficient for preventing progressive kyphosis, as is graft failure due to fracture, absorption or slippage.[9] Use of internal fixation devices in the surgery seems to be the best choice for stabilizing the spine, for early return to daily life activities, normal comfort levels and for maintaining the degree of correction.[15]

We present our experience of 40 cases of dorsal and dorsolumbar spinal tuberculosis treated surgically from October 2004 to September 2009 at department of neurosurgery, unit 2, Lahore General Hospital and at department of neurosurgery Allama Iqbal Medical College and Jinnah Hospital, Lahore, by Zafar Iqbal.

MATERIALS AND METHODS

It is a retrospective analysis of data obtained in all the patients with dorsal and dorsolumbar spinal tuberculosis with severe motor deficit admitted to and surgically treated in departments of neurosurgery unit 2, Lahore General Hospital and at department of neurosurgery Allama Iqbal Medical College and Jinnah Hospital Lahore from October 2004 to September 2009. All the data regarding patients such as history, clinical examination, imaging finding, operation notes and follow up were retrospectively analyzed. Cases with a minimal follow up of 3 months were included in the study. The Frankel classification system was used to grade the neurological dysfunction. Frankel grades A, B and C were considered to reflect the presence of severe motor deficit.

RESULTS

Overall 42 patients of dorsal or dorsolumbar spinal tuberculosis with severe neurological deficit had surgery during specified period. Of these two had follow up of less than 3 months and were categorized as lost to follow up sex incidence. Twenty four (60%) were male and 16 (40%) were female.

Age Range

Their age range from 18-65 years with a mean age of 31 years.

Table 1: *Sex Incidence.*

Sex	No.	%
Male	24	60%
Female	16	40%
Total	40	100%

Table 2: *Clinical Presentation.*

Pain	Local	34	85%
	Radicular	5	12.5%
	Dysaesthesias	5	12.5%
Motor Dysfunction	G – 9/5	28	70%
	G – 3/5	12	30%
Spasticity		36	90%
Sensory deficit		38	95%
Sphincter dysfunction		24	60%
Fever		10	25%

Clinical Presentation

The clinical presentation of these patients is summarized in Table 2.

Fever was present in 10 patients. Two patients had concurrent pulmonary tuberculosis. Four patients had previous history of pulmonary tuberculosis. The level of compression was dorsal 32 and dorsolumbar 8. Ten patients were already receiving antituberculous treatment at admission and either were not recovering or had worsening of neurological deficit. Two patients had Frankel grade A, 26 had Frankel grade B and 12 had Frankel grade C on admission.

Investigations

Routine blood tests including erythrocyte sedimentation rate, anteroposterior and lateral x-rays of the spine and chest x-rays were carried out in all patients. CT scan of relevant area of the spine was carried out in selected cases. All patients had magnetic resonance imaging and it revealed anterior compression with involvement of vertebral bodies in 36 patients, 2 patients had involvement of posterior element and 2 patients had no bony involvement and just extradural sleeve of granulation tissue. Two Patients had skip lesions. Severe kyphotic deformity (kyphotic angle > 25 degree) was present in 34 patients. Number of involved vertebrae ranged from 1-4.

Operative Procedure Carried Out

Thirty two (80%) patients underwent corpectomies and titanium cage fixation with plate and screws. Bone graft was harvested from resected rib. Four patients who had involvement of posterior element (2 with epidural sleeve of granulation tissue) underwent laminectomy and removal of granulation tissue as shown in table 3. Two patients had laminectomy and Harshill loop fixation and 2 patients had costotransversectomy. The preferred operative procedure for anterior compression was corpectomy of involved vertebrae and titanium cage fixation. Laminectomy, decompression and drainage and Harshill loop was carried out when compression was upper dorsal area (D3 – D4) and costotransversectomy was carried out in relatively old patients who had upper dorsal spinal tuberculosis. All patients had follow up radiographs at intervals to assess the degree of bony fusion, position of implants and any loss of correction of kyphotic deformity. Histopathology confirmed spinal tuberculosis in all patients.

Postoperative Course and Complications

Patients were administered potent analgesic and had aggressive chest and leg physiotherapy. Patients, who had chest tube after thoracotomy, had regular chest examination and chest x-rays and chest tubes were removed when drainage fluid was less than 100 ml / 24 hrs and chest x-ray confirmed complete lung expansion without any abnormality. Two patients had lung collapse and 3 had pneumonia, all recovered after chest physiotherapy and antibiotic cover. Two patients had deep venous thrombosis and recovered on anticoagulants, 3 patients had superficial wound infections. The duration of total hospital stay ranged from 2 weeks to 2 months. All patients were advised to take ATT for 12 – 24 months depend upon ESR and clinical picture.

Table 3: *Operate Procedure.*

Procedure	Number	Percentage
Corpectomy and Cage fixation	32	80%
Laminectomy and removal of granulation tissue	4	10%
Laminectomy and harshill Lup fixation	2	2.5%
Costotransversectomy	2	2.5%

Follow up

The follow up ranged from 3 months to three years, the mean follow up duration was of 14 months. Monitoring was carried out by repeated x-rays, complete blood count, erythrocyte sedimentation rate and liver function test.

CLINICAL OUTCOME (RESULTS)

Pain

At the last follow up, out of 34 patients who had local pain, 30 were pain free, 4 patients had some degree of local pain. Radicular pain improved in all 5 patients with this symptom. Out of 5 patients who had dysaesthetic pain, 2 still had some pain and were on pregabalin. See Group 1.

Motor Deficit

At the time of discharge 5 patients (17.8%) out of 28 patients who had Frankel grade A/B at the time of admission, improved to Frankel grade D. Out of 12 patients with pre-op Frankel grade C, 8 (66.6%) improved to Frankel grade D. All these patients showed

slow improvement and at last follow up 24 (85.7%) out of 28 patients with Frankel grading A/B at admission improved to Frankel grade D/E.

Table 4: *Frankle grading.*

Grade	Sensation and Motor Activity
A	Sensation – Absent Motor Activity – Absent
B	Sensation – Intact Motor activity – Absent
C	Sensation – intact Motor power present but not useful
D	Sensation – Intact Motor power below Normal
E	Sensation – Normal Motor power – Normal

Table 5: *Outcome of Motor Power.*

Grade	Pre-op	Post-op
A	12	
B	16	2
C	12	3
D	0	15
E	0	20

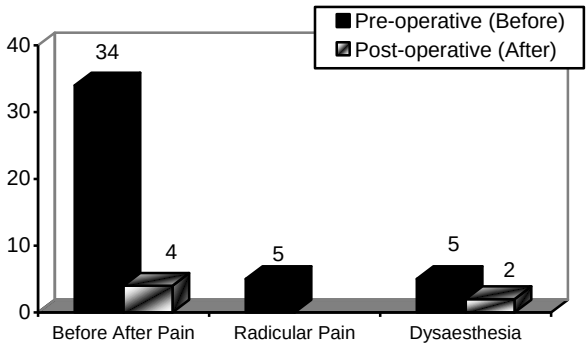

Fig. 1: *Outcome of Pain.*

Eleven (91.6%) out of 12 patients with preoperative Frankel grading C improved to Frankel grading D/E. At last follow up 35 patients improved from Frankel grade A, B, C to Frankel grade D/E (87.5%) See Table 5.

Spasticity

Out of 36 spastic patients 32 (88.88%) showed marked improvement and only 4 (12.12%) had significant spasticity at last follow up.

Sensory Deficit

Out of 38 (95%) patients who had pre-op sensory deficit, 36 (94.7%) showed complete recovery.

Bladder Dysfunction

Out of 24 (60%) patients who had pre-op bladder dysfunction, 21 (87.5%) patients showed complete recovery. On (4.1%) patient had persistent incontinence and 2 (8.2%) had difficulty in passing urine.

Spinal Deformity

Severe kyphotic deformity (kyphotic angle > 25) was present in 34 (85%) patients pre-operatively, 32 had corpectomy and cage fixation with good correction of kyphotic angle (on average by 18 degree). |There was loss of correction by 1 degree (a loss of 5.6%) in 6 patients with cage fixation and all patients with Harshill loop.

Mechanical Instability

All patients who had corpectomy and cage fixation had bony fusion in 9-12 months. There was no case of implant failure at last follow up.

FACTORS AFFECTING IMPROVEMENT IN MOTOR DEFICIT

Age

A statistical significant correlation was observed between poor outcome and age greater than 50 years. Motor function in 28 (93.33%) patients out of 30 patients younger than 50 years improved as compared to 7 (70%) patients out of 10 older than 50 years of age.

Type of Paralysis

Out of 36 hypertonic / spastic patients, 33 (91.66%) showed improvement and out of 4 flaccid paraplegic only 2 (50%) showed improvement at last follow up. That shows flaccidity is a bad prognostic factor.

Bladder Dysfunction

Out of 24 patients with bladder involvement on admission, 20 (83.3%) patients showed improvement in motor deficit to Frankel grade D/E. Out of 16 patients who did not show bladder involvement 15 (93.75%) showed improvement so patients with bladder involvement indicate severe cord compression and rather poor prognosis.

Type of Operative Procedure

Out of 32 patients who had corpectomy and cage fixation, 30 (93.75%) showed marked improvement in motor function, but out of 4 patients who had costotransversectomy and Harshill loop procedure, 3 (75%) showed improvement indicating that relatively smaller procedures are inferior in outcome than corpectomy and cage fixation in patients with anterior compression.

Table 6: *Results.*

				Improvement No. (% age)
Pain	Local Radicular Dysthesias	34 5 5	85% 12.5% 12.5%	30 (88.2%) 5 (100%) 3 (60%)
Motor Dysfunction	G 0/5 G – 3/5	28 12	70% 30%	24 (85.7%) 11 (91.6%)
Spasticity		36	90%	32 (88.88%)
Sensory deficit		38	95%	36 (94.7%)
Sphincter Dysfunction		24	60%	21 (87.5%)

DISCUSSION

The discovery of specific antituberculous drugs had revolutionized the treatment of patients with spinal tuberculosis.[9,11] We concur with Hamzaoglu[12] and Moon[13] et al who stated that if diagnosed early spinal TB is medically treatable. Moon et al reported that in patients treated with long term (12 – 18 months) triple chemotherapy, the disease is inactivated at 6 months on average and that fusion occurs in 36 months in 87.5% of cases. Both the British and American thoracic societies, based on the evidence of MRC trials, advocate short course chemotherapy (6 months) for adult uncomplicated, fully sensitive spinal tuberculosis.[14,15] However, there is some controversy about the optimal duration of ATT drug regimen for management of spinal TB when medical treatment is combined with radical surgery.[16,17]

Although chemotherapy remains the mainstay in the treatment of spinal tuberculous, surgical procedures play an important role. Antituberculous chemotherapy has not been shown to satisfactorily prevent associated kyphotic deformity.[9,18,19] In the prevention of progression of deformity, external support and prolonged recumbancy have been found to be ineffective.[9,18] Thus preventing kyphotic progression remains the main problem in such cases.

Surgery is advocated in the presence of spinal deformity, significant neurological dysfunction at presentation, failure of non-operative management for 6-8 weeks, persistent severe pain and neurological dysfunction that did not resolve or that developed while patients with spinal tuberculosis underwent medical treatment.[6] In addition, older patients with paraplegia due to spinal tuberculosis require decompressive surgery to avoid the hazards of prolonged immobilization.[4] Nussbaum et al[20] recommended surgical treatment even in patients with mild neurological deficit because both epidural infection and bone destruction typically progress for a variable period after ATT chemotherapy has been started. Close to undertake surgery in patients with severe neurological dysfunction, vertebral body collapsed > 50%, kyphotic angle > 25 degree, epidural abscess causing compression of dural sac or large paravertebral abscess, radicular or medullary compression due to granulation tissue, abscess are sequestered bone, and in cases in which diagnoses was not certain on clinical and imaging studies. Various surgical methods have been used to treat spinal tuberculosis. There are several surgical techniques, abscess drainage,[21,23] anterior strut grafting,[23,24] anterior instrumentation,[25,26] posterior instrumentation,[17,27] combined anterior and posterior stabilization,[28,29] and video assisted minimally invasive thoracoscopic spinal operation.[30] Combined anterior radical debridement and arthrodesis have many advantages over other procedures including direct access to and excision of focus of disease, rapid healing by osseous union, and decreased tendency for progressive collapse of kyphotic angulation.[9] In most of our cases, as main pathological process was anterior causing severe neurological deficit, so we adopted anterior approach with overall improvement in neurological function by 87.5% (35 patients out of 40). Govender[31] analyzed 41

cases of spinal tuberculosis associated with severe neurological deficit treated by corpectomy and fixation. Complete neurological recovery at 1 year was 78%. Recovery rates ranging from 53% to 83% after surgery have been documented in several other studies.[5,32] Sai Kiran et al[33] reported good functional improvement in 89.5% of their patients.

We found that age > 50 yrs was associated with poor outcome in terms of recovery in neurological function, others have also reported a better outcome in younger patients.[34,35] This impaired recovery in old people could be due to arteriosclerosis as shown by Griffiths et al[36,37] experimentally. In present study rate of recovery was delayed in patients with Frankel grade A, B 9at time of discharge 17.8% patients improved to grade D/E. (5 out of 28 as compared to Frankel grade C patients 66.6% improved i.e 8 patients out of 12 at the time of discharge). But final outcome was quiet comparable and not statistically significant (24 out of 28 Frankel grade A, B improved to grade D, E that is 85.7% and 11 out of 12 grade C patients improved to grade D/E 91.6%).

As for duration of paraplegia at presentation is concerned, out of 5 patients who had duration of paraplegia for > 4 months at presentation, only 2 improved to grade D/E showing poor outcome as compared to other patients. Conflicting reports are found in different studies.[33,34]

In our series, out of 5 patients who did not recover neurologically, 2 had flaccid paralysis indicating that flaccidity is a poor prognostic factor as has been found by others.[33]

Radical drainage without fixation can result in mechanical instability and progressive deformity and may require fixation later on.[23,41] Two patients in our series who had costotransversectomy developed progressive kyphotic deformity. We achieved, on average, 18 degree correction of kyphotic angle and loss of 1 degree at final follow up (5.6%) which is comparable with that reported by Zhao et al.39

CONCLUSION

A significant proportion of patients with spinal TB and severe neurological deficit showed remarkable improvement in neurological function, pain relief, spasticity and bladder function after surgical decompression combined with antituberculous treatment. The anterior approach is by far the superior approach because it leads to the lesion directly, spinal cord can be decompressed under direct vision, bone grafting and instrumentation can be carried out providing instant stability, correction of kyphotic deformity and early mobility of patients. Impaired recovery is seen in older patients, flaccid paralysis and long duration of paraplegia. Patients who had radical debridement without fixation should be followed carefully for progressive deformity and instability and appropriate procedure carried out once it is detected.

Address for Correspondence:
Dr. Zafar Iqbal
Associate Professor
Department of Neurosurgery
Lahore General Hospital, Lahore
0321-4314442

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